Space Weather Forecast

Issued on Tuesday, 19 September 2023 at 01:28 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further G1-G2 minor/moderate storms expected during day 1 (Tuesday 19th September), with CME (coronal mass ejection) arrivals bringing a slight chance of a G3/Strong storm. Chance of isolated R1 Minor Radio Blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Low over the past 24 hours. There are currently nine numbered sunspot regions on the visible disc. The previously active region in the west has continued to see a general weakening but two newer regions continuing to develop and are rapidly becoming the focus for potential activity in the western hemisphere. The largest region on the disk remains in the east, this region has seen its previous leading spot re-numbered, with itself showing some increased magnetic complexity as it continues to rotate. Remaining groups have shown only minor changes in overall evolution, with the regions rounding the southeast and northeast limbs numbered recently.

No new Earth-directed CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds were at slightly elevated levels initially, between 430-480km/s. Wind speeds rapidly increased from 18/1255 UTC with the arrival of a CME, with speeds becoming elevated and varying between 500-600km/s through the remainder of the period. The total magnetic field was steady and weak initially, but increased slightly following 18/0200 UTC to moderate levels, with a rapid increase following the arrival of the CME to become strong before and a slow decline back towards moderate levels in recent hours. The north-south component showed a similar trend varying between weakly initially, becoming moderately positive with the arrival of the CME, before varying strongly in recent hours. Geomagnetic activity, as measured by BGS, was at Quiet to Active levels (Kp 2-4) initially, but became Active to G1 Minor geomagnetic storm (Kp4-5) with the arrival of the CME.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain generally Low, but with a continued chance of isolated Moderate flares.

Solar Wind / Geomagnetic Activity: There are currently two CMEs that feature in the forecast. The first CME is likely associated with a moderate flare on the 14 Sep. This feature may be the CME currently moving through the near Earth environment. There is some uncertainty however with a second and perhaps more significant CME expected from a large filament (arc of plasma) lift off which occurred early on the UTC day of 16 Sep. Modelling suggests a likely Earth directed component with an arrival time sometime during Day 1 (19 Sep). Analysis of both these features was complex however, reducing forecast confidence, and it may be that the CME currently

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affecting Earth may be associated with an early arrival of the second CME. Either way CME effects are expected to continue through Day 1 (19 Sep), before easing into Day 2 (20 Sep). Active to G1-G2/Minor-Moderate storm intervals expected during Day 1 (19 Sep), with a Chance of a G3/strong storm due to the potential arrival of further CME activity associated with the filament eruption on 16 Sep. CME effects expected to linger into Day 2 (20 Sep) but likely waning by Days 3-4 (21-22 Sep), with generally Quiet to Unsettled conditions returning.

UK Aurora Forecast: The coming period is likely to see some enhanced auroral displays at high geomagnetic latitudes, with aurora visible perhaps as far south as Northern Ireland and northern England. A recent CME arrival is expected to increase activity into Day 1 (19 Sep) and could extend overnight into early Day 2 (20 sep), as a large and central CME which left the Sun during Saturday morning UTC is expected to arrive at Earth. However, there is some uncertainty in arrival timing and it may have now arrived early. Weather conditions however, do unfortunately look unfavourable for prolonged clear skies for most regions at present.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, with only a slight chance of an enhancement should any larger flares occur, or perhaps early in the period in association with CME arrival.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	80	60	20	10
Strong	G3	No	30	10	1	1
Severe	G4	No	2	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	30	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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